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SOME PRE-PLANTING TREATMENTS OF SEED CLOVES AFFECTING ON DRY WEIGHT, YIELD AND BULB QUALITY UNDER DIFFERENT PLANTING DATES

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ABSTRACT

Two field experiments were carried out in sandy loam soil at El-Sofia village (Private Farm), Awlad Sacker, Sharkia Governorate, Egypt on Chinese garlic (Sids-40) during the winter growing seasons of 2006/2007 and 2007/2008. The aim of this study was to study effect of soaking seed cloves in running water for 0, 24, 48 and 72hours, soaking in running water for 0, 24, 48 and 72hours, then stratification of seed cloves in wet Jute for 24 hours and the effect of cold storage of seed cloves at 7°C for 0, 1, 2 and 3weeks, before planting. The treatments also included the effect of planting date (15th August, 1st September) on plant growth, yield and its components, as well as bulbs and cloves traits. The obtained results showed that planting date (1st September) led to significant increases in all tested characteristics of dry weight, total yield and its components, as well as of bulbs quality. Soaking seed cloves in running water for 24 hours before planting led to significant increases in dry weight, total yield and its components. Moreover quality of bulbs improved compared with the control and the other treatments. Positive interaction between planting dates and soaking, soaking plus stratification and cold storage for seed cloves before planting were often observed.

Keywords: Garlic (*Allium sativum* L.), planting date, stratification, soaking cloves, cold storage.

INTRODUCTION

Garlic (*Allium sativum* L.) is one of the oldest and popular vegetable crops in Egypt. It is one of the most important bulb crops in Egypt which is cultivated for both local consumption and export. It is commonly used as a spice or condiment as well as for medical purposes.

The pathway for improving the yield and quality of garlic is the planting date and some treatments for seed cloves before planting, such as cold storage, pre-planting cloves soaking in water and pre-planting cloves soaking in water and stratification. The early planting dates, i.e., 1st and 15th September are the best for garlic production in Lower Egypt (Maksoud *et al.*, 1984a), since the early planting leads to obtain a strong vegetative growth on which bulb yield and its quality depend. Because of the fields are still occupied in this period with the summer crops, many of the garlic growers are relatively late in garlic planting, and this would lead to evident reduction in the bulb production due to poor vegetative growth (Rahim *et al.*, 1984). Thus it would be very important to obtain good quality during such late plantation.

El-Shabasi (1988); Ahmed (2002) and Rahman *et al.*, (2004) who reported that dry weight of garlic plants (whole plants or leaves) were significantly increased when cloves were planted on 1st Sept. Cold storage and prolonged duration of pre-planting stocks induced early emergence of

cloves, increased germination percentage and enhanced crop maturity (El-Motaz *et al.*, 1967; Hwang and Kosa, 1984 and Maksoud *et al.*, 1984b). Clove differentiation was more rapid when the pre-planting storage temperature was 5C° (Rahim and Fordham, 1988 and Hwang *et al.*, 1989). Cold storage also can shorten the critical photoperiod (Takagi, 1990). It is in view of this background that this study was undertaken with the aim of exploring opportunities to improve the productivity of Chinese garlic crop cv. (Sids-40) through choice of planting date, and some pre-planting treatments of seed cloves (soaking in tap water, soaking + stratification and cold storage).

MATERIALS AND METHODS

Two field experiments were conducted on garlic plants (Sids-40) during the winter seasons of 2006/2007 and 2007/2008 at El-Sofia village (Private Farm), Awlad Sacker, Sharkia Governorate. It aimed to study the effect of times of planting (15th August, 1st September) and effect of some pre-planting treatments (soaking seed cloves in running water for 0, 24, 48 and 72hours, soaking in running water for 0, 24, 48 and 72hours and stratification of seed cloves in wet Jute for 24 hours, and cold storage for seed cloves in a fridge at 7°C for 0, 1, 2 and 3weeks) on the dry weight, yield and bulb quality of garlic *CV.* Sids-40.

1. The experimental soil analysis

A sample of soils was randomly collected from the experimental soil at 0 to 50 cm depth, before plantation to determine the physical and chemical properties. Data of soil analysis during 2006/2007 season are presented in Table (1).

Table (1): The physical and chemical analysis of the experimental soil during 2006/2007 season.

Soil Properties		Soil Properties	
Physical	**Value**	**Soluble anions**	**Value**
Sand (%)	74.5 %	$HCO_3 + CO_3$ (meq/L)	6.0
Silt (%)	7.5 %	Cl^- (meq/L)	5.4
Clay (%)	18 %	SO_4^{2-} (meq/L)	6.6
Texture	Sandy loam	Total N(mg/Kg^{-1})	56
Chemical	**Value**	Avial.P(mg/Kg^{-1})	12.0
EC (ds/m^{-1} at 25°C)	1.80	Avial.K(mg/Kg^{-1})	370
pH	7.62	Organic matter (%)	1.28
		Soluble cations	**Value**
		Na^+ (meq/L)	12.5
		K^+ (meq/L)	0.51
		Ca^{2+} (meq/L)	2.6
		Mg^{2+} (meq/L)	2.4

2. Meteorological data

Average meteorological data for Sharkia Governorate (Abou-Kaber Station) during two growing seasons of garlic (2006/2007 and 2007/2008) are recorded in Table (2).

Table (2): Show average meteorological data for Sharkia Governorate (Abou-Kaber Station) during the growing seasons of 2006-2007 and 2007-2008.

Month	Average of air temperature (C°)	Average daily of relative humidity (RH %)	Soil temperature at 20 (cm)	Pan evaporation (mm/day)
	2006/2007 season			
August	30.34	66.35	27.01	5.91
September	29.09	62.83	26.76	4.62
October	26.34	63.20	23.74	3.47
November	21.66	61.43	20.81	2.58
December	17.69	64.03	16.35	2.11
January	16.09	62.94	14.31	1.58
February	17.04	65.04	15.56	2.07
March	19.11	60.74	17.45	3.23
April	22.60	57.60	20.17	4.73
	2007/2008 season			
August	31.82	67.35	27.03	5.90
September	30.11	65.50	25.82	4.72
October	29.03	62.19	23.22	3.74
November	24.18	62.63	19.45	2.97
December	19.19	63.16	14.86	2.84
January	15.60	65.39	11.79	1.85
February	17.28	65.45	12.52	2.32
March	22.88	62.10	17.9	3.93
April	27.99	56.71	23.65	7.19

3. The experimental design and tested treatments

The experimental design was a split-plot with 3 replicates. The main-plots were devoted to the times of planting, while the sub-plots were some pre-planting of seed cloves (soaking in water, soaking + stratification and cold storage). This experiment included 24 treatments which were combination between two planting dates and 12 treatments of seed cloves before planting as shown in Schedule (1). The sub-plots area was 5.4m² which contained 3 rows each 3m long and 0.6m width. The uniformed cloves of *CV.* Sids-40 were chosen and planted at 10cm apart on the two sides of each row.

4. Cultural practice

All field plots were fertilized with 20 m^3 farmyard manure, 120 kg of ammonium sulphate (20.5% N), 75 kg of calcium super phosphate (15% P_2O_5), 72 kg of potassium sulphate (48% K_2O) and 300 kg sulpher/feddan which was divided in four equal portions at these times as follows:-

1) 20 m^3 farmyard manure + 25 kg of calcium super phosphate (15% P_2O_5) + 150 kg sulpher + 20 kg of ammonium sulphate (20.5% N)/feddan during the soil preparation.

2) 50 kg of ammonium sulphate (20.5% N) + 20 kg of calcium super phosphate (15% P_2O_5) + 12 kg of potassium sulphate (48% K_2O) + 150 kg sulpher after complete emergence.
3) 30 kg of ammonium sulphate (20.5% N) + 20 kg of calcium super phosphate (15% P_2O_5) + 24 kg of potassium sulphate (48% K_2O) after one month from the second.
4) 20 kg of ammonium sulphate (20.5% N) + 10 kg of calcium super phosphate (15% P_2O_5) + 36 kg of potassium sulphate (48% K_2O) after one month from the third. The control of insects and pests were used according to the instruction laid down by the Ministry of Agriculture. The harvesting time was done in the first week of March for both seasons of study.

Schedule (1): Show the combination between planting date and some pre-planting treatments of seed cloves of garlic.

Planting date	Pre-planting treatment of seed cloves
15th Aug.	Soaking in tap water for 0 hr.
	Soaking in tap water for 24 hr.
	Soaking in tap water for 48 hr.
	Soaking in tap water for 72 hr.
	Soaking in tap water for 0 hr. + Stratification in wet Jute for 0 hr.
	Soaking in tap water for 24 hr. + Stratification in wet Jute for 24 hr.
	Soaking in tap water for 48 hr. + Stratification in wet Jute for 24 hr.
	Soaking in tap water for 72 hr. + Stratification in wet Jute for 24 hr.
	Cold storage in a fridge at 7 C° for 0 week.
	Cold storage in a fridge at 7 C° for 1 week.
	Cold storage in a fridge at 7 C° for 2 week.
	Cold storage in a fridge at 7 C° for 3 week.
1st Sept.	Soaking in tap water for 0 hr.
	Soaking in tap water for 24 hr.
	Soaking in tap water for 48 hr.
	Soaking in tap water for 72 hr.
	Soaking in tap water for 0 hr. + Stratification in wet Jute for 0 hr.
	Soaking in tap water for 24 hr. + Stratification in wet Jute for 24 hr.
	Soaking in tap water for 48 hr. + Stratification in wet Jute for 24 hr.
	Soaking in tap water for 72 hr. + Stratification in wet Jute for 24 hr.
	Cold storage in a fridge at 7 C° for 0 week.
	Cold storage in a fridge at 7 C° for 1 week.
	Cold storage in a fridge at 7 C° for 2 week.
	Cold storage in a fridge at 7 C° for 3 week.

hr: hour.

5. Data recorded

The following data were recorded during the plant growth period and at harvesting date.

5.1. Dry weight / plant

The vegetative parts (bulbs and leaves) of chosen plants of each plot at 100, 130 and 160 days were oven dried at 70C° till constant weight and the following data were recorded.

a. Total dry weight.

b. Relative total dry weight (%) = $\frac{\text{Dry weight of treatment}}{\text{Dry weight of control}} \times 100$

5.2. Total Yield

At harvesting date (the first week in March in both seasons), all plants of each plot were harvested weighed and converted to record the following data:

a. Average yield/plant (kg).

b. Total yield (ton/fed.).

c. Relative total yield (%) = $\frac{\text{Total yield of treatment}}{\text{Total yield of control}} \times 100$

5.3. Bulb quality

A random sample from five plants (bulb + leaves) was randomly taken from each plot at harvesting date weighed as fresh weight and bulbs were separated and weighed as fresh weight. The bulbs were oven dried at 70C° till constant weight and the following data were recorded:

a. Average bulb and neck diameter (cm).

b. Bulbing ratio: It was measured as reported by Mann (1952).

$$\text{Bulbing ratio} = \frac{\text{Plant neck diameter}}{\text{Bulb diameter}}$$

c. Bulb dry matter (%) = $\frac{\text{Bulb dry weight}}{\text{Bulb fresh weight}} \times 100$

d. Percentage of bulb net weight = $\frac{\text{Bulb fresh weight}}{\text{Whole plant fresh weight}} \times 100$

5.4. Statistical analysis

All obtained data were subjected to statistical analysis of variance according to Snedecor and Cochran (1980) and means separation was done according to the least significant difference (L.S.D) and Duncan (1958) at 5 % levels of probability.

RESULTS AND DISCUSSION

Dry weight/plant: Respecting planting date, data of Table (3) declared that planting date of 1st Sept. gave higher dry weight than those planting date of 15th Aug. at 100, 130 and 160 after planting. The differences were significant in the two seasons of study, except that at 130 and 160 days in the second season, the increments were not significant.

The increase in total dry weight/plant at 160 days after planting were about 21 and 17 % for planting date at 1st Sept. over the planting date at 15th

Aug. in the 1st and 2nd seasons, respectively. These results are in accordance with those reported by El-Shabasi (1988); Ahmed (2002) and Rahman *et al.*, (2004) who reported that dry weight of garlic plants (whole plants or leaves) were significantly increased when cloves were planted on 1st Sept.

Concerning the effect of soaking cloves in water, data in Table (3) show that soaking seed cloves in water for 24 hours, insignificantly increased the dry weight of plants over the un-soaked plants or those soaked for 48 and 72 hours at 100,130 and 160 days after planting in both seasons.

The increase in total dry weight/plant were about 3 and 12 % for soaking in water for 24hr. at 160 days after planting over the control in both seasons, respectively. Regarding soaking and stratification treatment, such data revealed that there were no significant differences among the treatments and the trend of the results were very similar to those soaked without stratification. Soaking and stratification decreased total dry weight/plant compared with control. Similar results were obtained by Osman *et al.*, (1996).

As for the effect of cold storage before planting, such data confirmed that at 100 and 130 days, the highest dry weight was obtained from plants, produced from cloves stored at 7C° for one week compared with control or with the storage period of two or three weeks. However, after 160 days of planting, data declared that cold storage decreased dry weight of garlic plants. Cold storage of cloves decreased total dry weight/plant compared to control. The reduction in dry weight was correlated with each increase in the storage period. These results coincide with those found by El-Shabasi, (1988) and Sedoguchi *et al.*, (2002).

In general, the results show that cold storage of seed cloves in a fridge at 7 C° increased dry weight/plant at early growth stage (100 days after planting), while soaking of seed cloves for 24hr. increased dry weight/plant at medium and maximum growth stages (130 and 160 days after planting) in both seasons.

As for the interaction effect of planting time and soaking cloves in water (0, 24, 48 and 72 hr.), soaking as previous and stratification for 24hr. and cold storage (Zero -one - two or three weeks) prior to planting on the dry weight of garlic plants, presented data in Table (4) show a significant interaction between treatments at 100, 130 and 160 day after planting in both seasons. Data also cleared that at 100 days, the best values were obtained from cold storage for one week with 1st Sept. planting time. At 130 and 160 days after planting, results showed that the differences among treatments of soaking or soaking and stratification were fluctuated with no definite trend. This was evident in both seasons of study. Similar results were obtained by Abd El-Hameid, (1982).

Table (3): Effect of planting date and some pre-planting treatments of seed cloves on dry weight/plant (bulb + leaves) of garlic at 100, 130 and 160 days after planting during winter seasons of 2006/2007 and 2007/2008.

Treatments	Dry weight (bulb + leaves) / plant (gm)						Relative dry weight (%)	
	Days after planting							
	100		130		160		160	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Planting date								
15th August	4.34 b	4.02 b	6.06 b	7.49 a	11.77 b	9.30 a	100	100
1st September	6.36 a	5.02 a	9.64 a	7.68 a	14.34a	10.90 a	121	117.20
Some pre-planting treatments of seed cloves								
Soaking for 0 hr.	4.93 de	4.31 b	8.10 a	8.03bcd	14.55 a	11.74abcd	100	100
Soaking for 24 hr.	5.21cde	4.89 b	8.72 a	9.42a	15.00 a	13.18 a	103	112
Soaking for 48 hr.	4.23 e	4.40 b	8.43 a	8.93ab	14.30 a	11.60abcd	98	99
Soaking for 72 hr.	5.14cde	4.55 b	8.23 a	7.50cd	14.96 a	10.60cd	103	90
Soaking for 0 hr. + stratification for 0 hr.	4.59 de	4.48 b	8.47 a	7.67cd	15.19 a	12.27ab	100	100
Soaking for 24 hr. + stratification for 24 hr.	5.27cd	4.61 b	8.42 a	8.03bcd	14.38a	11.95abc	95	97
Soaking for 48 hr. + stratification for 24hr.	4.99 de	4.56 b	7.67a	8.12bcd	14.40 a	11.65abcd	95	95
Soaking for 72 hr. + stratification for 24 hr.	5.12cde	4.18bc	8.13 a	7.82bcd	14.04 a	10.63cd	92	97
Cold storage at 7C° for 0 week	4.44 de	3.42 c	7.34 a	7.00 d	13.19ab	10.76bcd	100	100
Cold storage at 7C° for 1 week	7.63 a	5.73 a	7.92 a	8.49abc	11.88 b	10.27 d	90	95
Cold storage at 7C° for 2 week	6.59 b	4.74 b	7.36 a	5.79 e	8.87 c	4.07 e	67	40
Cold storage at 7C° for 3 week	6.12bc	4.39 b	5.46 b	4.26 f	5.90d	2.51 e	45	23

Values having the same alphabetical letters did not significantly differ at 0.05 level of significance according to Duncan's multiple range test.

Table (4): Effect of interaction between planting date and some pre-planting treatments of seed cloves on dry weight/plant (bulb + leaves) of garlic at 100, 130 and 160 days after planting during winter seasons of 2006/2007 and 2007/2008.

Treatments		Dry weight (bulb + leaves) / plant (gm)						Relative dry weight (%)	
		Days after planting							
		100		130		160		160	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Planting date X Some pre-planting treatments of seed cloves									
15th August	Soaking for 0 hr.	3.56	3.99	6.47	8.09	12.39	10.52	100	100
	Soaking for 24 hr.	4.36	4.50	5.92	9.76	12.93	12.13	104	115
	Soaking for 48 hr.	3.41	4.64	7.43	9.20	13.71	11.77	111	112
	Soaking for 72 hr.	4.36	4.26	6.73	8.45	13.37	11.17	110	112
	Soaking for 0 hr. + stratification for 0 hr.	4.08	4.00	4.35	7.76	12.82	11.78	100	100
	Soaking for 24 hr. + stratification for 24 hr.	4.59	4.14	6.71	8.16	11.61	11.16	91	112
	Soaking for 48 hr. + stratification for 24hr.	4.70	4.56	6.31	8.47	14.32	10.86	112	92
	Soaking for 72 hr. + stratification for 24 hr.	4.16	4.06	6.32	8.63	11.83	9.85	92	84
	Cold storage at 7C° for 0 week	3.62	3.11	6.09	6.38	11.67	9.19	100	100
	Cold storage at 7C° for 1 week	5.90	4.42	7.10	7.64	11.88	9.04	102	98
	Cold storage at 7C° for 2 week	4.94	3.39	4.84	4.61	7.85	2.32	67	25
	Cold storage at 7C° for 3 week	4.43	3.22	4.49	2.77	6.87	1.82	58	20
1st September	Soaking for 0 hr.	6.29	4.62	9.73	7.96	16.70	12.96	100	100
	Soaking for 24 hr.	6.06	5.28	11.52	9.08	17.07	14.22	102	110
	Soaking for 48 hr.	5.04	4.16	9.43	8.65	14.88	11.43	89	88
	Soaking for 72 hr.	5.92	4.83	9.72	6.55	16.55	10.02	99	77
	Soaking for 0 hr. + stratification for 0 hr.	5.09	4.95	12.58	7.57	17.56	12.76	100	100
	Soaking for 24 hr. + stratification for 24 hr.	5.94	5.08	10.13	7.90	17.15	12.73	98	100
	Soaking for 48 hr. + stratification for 24hr.	5.28	4.56	9.03	7.77	14.47	12.44	82	97
	Soaking for 72 hr. + stratification for 24 hr.	6.07	4.30	9.93	7.00	16.24	11.40	92	89
	Cold storage at 7C° for 0 week	5.25	3.72	8.59	7.62	14.71	12.32	100	100
	Cold storage at 7C° for 1 week	9.36	7.04	8.74	9.33	11.88	11.50	81	93
	Cold storage at 7C° for 2 week	8.24	6.08	9.88	6.97	9.88	5.82	67	47
	Cold storage at 7C° for 3 week	7.80	5.56	6.42	5.75	4.93	3.19	34	26
L. S. D at 5%		1.44	1.09	2.48	1.71	3.00	2.25		

Total yield: Results of Table (5) show the effect of planting date, soaking of cloves in water, soaking + stratification and cold storage of cloves before planting on yield/plant and yield/*fed.* in 2006/2007 and 2007/2008 seasons. Concerning the effect of planting date, the data indicated that planting date at 1st Sept. gave higher yield/plant and yield/*fed.* (7.303 and 4.773 ton/*fed.* in the 1st and 2nd seasons, respectively) than those from planting date at 15th Aug. (6.027 and 3.596 ton/*fed.* in the 1st and 2nd seasons, respectively).

This was evident in both seasons. Similar results were obtained by Maksoud *et al.*, (1984a); Shaheen, (1987); El-Behiedi *et al.*, (1988); El-Shabbasi, (1988); Abd El-Fatah, (1989); Singh and Phogat, (1989); Orowski and Rekowska, (1993); Ajmal *et al.*, (1997); Humayun *et al*, (1997); Ahmed, (2002); and Gupta *et al.*, (2003). They all concluded that Sept. planting gave the greatest yield with heavy bulbs.

The increases in total yield/*fed.* were about 17 and 32 % for planting date at 1st Sept. over the planting date at 15th Aug. in the 1st and 2nd seasons, respectively. It is obvious that the increment in total yield/*fed.* specially with 1st Sept. planting date., could be attributed directly, to increase in vegetative growth at such planting date, this is from one side and may be due to the climate requirements in Table 2 (temperature and photoperiod) which are available at optimum levels during Sept. month on other side. Temperatures greatly affect all the physiological processes, namely water absorption, minerals uptake, photosynthesis etc. that may be enhancing plant growth and consequently produced higher yield.

Earliest planting date gave the highest bulb weight, which may be due to plant received cool temperature for longer period which possibly increased the yield of bulb. Therefore, early grown plants produced large sized bulb resulting in the increased weight (Rahim *et al*, 2003). Concerning the effect of soaking and soaking and stratification on garlic yield, data of Table (5) show that soaking for 24 hours increased yield/plant and yield/*fed.* over the control and when compared with 48 or 72 hours. The differences were significant only in the first season, while in the second one the differences were not significant.

It could be concluded that, soaking of seed cloves in tap water for 24hr. increased yield/*fed.* in both seasons, with no significant differences with soaking for 48hr. in both seasons. The increase of total yield were about 18 and 5 % for soaking in water over the control in the 1st and 2nd season, respectively. As for the effect of soaking and stratification, such data reveal no significant effect on the yield/plant or yield/*fed.* in both seasons and decreased the yield than the control. These results are coinciding with those found by Abd El-Hameid (1982) and Osman *et al.*, (1996).

Data in the same Table declared that cold storage of seed cloves at 7 C° significantly decreased the yield/plant and the yield/*fed.* in both seasons. The reduction on yield/plant or yield/*fed.* were corresponded with each increase in cold storage period. These results are in accordance with those found by Maksoud *et al.*, (1983); El-Shabbasi, (1988) and Kasim, (2002) who concluded that cold storage had adverse effect on bulb weight and total yield.

Table (5): Effect of planting date and some pre-planting treatments of seed cloves on average yield/plant (kg) and total yield/feddan (ton) of garlic plants during winter seasons of 2006/2007 and 2007/2008.

Treatments	Average yield / plant (kg)		Total yield / feddan (ton)		Relative / yield (%)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season
Planting date						
15th August	0.046 b	0.031 b	6.207 b	3.597 b	100	100
1st September	0.055 a	0.036 a	7.303 a	4.773a	118	133
Some pre-planting treatments of seed cloves						
Soaking for 0 hr.	0.058bc	0.039a	7.632bc	5.035a	100	100
Soaking for 24 hr.	0.067 a	0.039a	8.994 a	5.280a	118	105
Soaking for 48 hr.	0.062ab	0.037 a	8.142ab	4.589a	107	91
Soaking for 72 hr.	0.058bc	0.039 a	8.625bc	4.777a	113	95
Soaking for 0 hr. + stratification for 0 hr.	0.059bc	0.039 a	7.805bc	5.073a	100	100
Soaking for 24 hr. + stratification for 24 hr.	0.055 c	0.037a	7.241c	4.628a	93	95
Soaking for 48 hr. + stratification for 24hr.	0.057bc	0.035ab	7.539bc	4.460ab	97	88
Soaking for 72 hr. + stratification for 24 hr.	0.059bc	0.036 a	7.846bc	4.572a	101	90
Cold storage at 7C° for 0 week	0.054 c	0.037 a	7.098c	4.685a	100	100
Cold storage at 7C° for 1 week	0.038 d	0.031b	5.037d	3.630b	71	77
Cold storage at 7C° for 2 week	0.220 e	0.018 c	2.842e	1.813c	40	39
Cold storage at 7C° for 3 week	0.018 e	0.016 c	2.310e	1.677c	33	36

Values having the same alphabetical letters did not significantly differ at 0.05 level of significance according to Duncan's multiple range test.

Regarding the interaction effect between planting date and soaking cloves for zero, 24, 48 or 72hr. and soaking for the same periods plus stratification in wet jute for 24 hours and cold storage for seed cloves at 7 C° for zero, one, two or three weeks, on yield/plant and yield/fed., obtained results in Table (6) declared that most treatment gave higher values with 1st Sept. than with 15th Aug. planting date. The highest values for both traits were obtained from the treatment of soaking 24 hours with 1st Sept. planting dates. The interactions between treatments of both traits were significant in both seasons. The positive interaction between planting date and soaking of seed cloves was found also by Abd El-Hameid, (1982).

Table (6): Effect of interaction between planting date and some pre-planting treatments of seed cloves on average yield/plant (kg) and yield/feddan (ton) of garlic plants during winter seasons of 2006/2007 and 2007/2008.

Treatments		Average yield / plant (kg)		Total yield / feddan (ton)		Relative total yield (%)	
		1st season	2nd season	1st season	2nd season	1st season	2nd season
Planting date X Some pre-planting treatments of seed cloves							
15th August	Soaking for 0 hr.	0.054	0.037	7.138	4.673	100	100
	Soaking for 24 hr.	0.066	0.039	8.776	5.164	123	111
	Soaking for 48 hr.	0.062	0.033	8.173	4.003	115	86
	Soaking for 72 hr.	0.054	0.035	8.183	4.151	115	89
	Soaking for 0 hr. + stratification for 0 hr.	0.054	0.037	7.148	4.736	100	100
	Soaking for 24 hr. + stratification for 24 hr.	0.048	0.034	6.391	4.113	89	87
	Soaking for 48 hr. + stratification for 24hr.	0.054	0.032	7.220	4.050	101	86
	Soaking for 72 hr. + stratification for 24 hr.	0.054	0.034	7.257	4.255	102	99
	Cold storage at 7C° for 0 week	0.049	0.034	6.473	4.214	100	100
	Cold storage at 7C° for 1 week	0.036	0.026	4.840	2.817	74	67
	Cold storage at 7C° for 2 week	0.013	0.014	1.722	0.574	27	14
	Cold storage at 7C° for 3 week	0.009	0.011	1.160	0.409	18	9
1st September	Soaking for 0 hr.	0.061	0.041	8.126	5.396	100	100
	Soaking for 24 hr.	0.068	0.039	9.112	5.395	112	100
	Soaking for 48 hr.	0.062	0.040	8.110	5.175	100	96
	Soaking for 72 hr.	0.061	0.043	9.067	5.403	111	100
	Soaking for 0 hr. + stratification for 0 hr.	0.064	0.040	8.461	5.410	100	100
	Soaking for 24 hr. + stratification for 24 hr.	0.061	0.040	8.091	5.143	96	95
	Soaking for 48 hr. + stratification for 24hr.	0.059	0.037	7.858	4.870	93	90
	Soaking for 72 hr. + stratification for 24 hr.	0.064	0.038	8.434	4.889	100	91
	Cold storage at 7C° for 0 week	0.058	0.039	7.723	5.156	100	100
	Cold storage at 7C° for 1 week	0.040	0.036	5.234	4.442	68	86
	Cold storage at 7C° for 2 week	0.030	0.021	3.961	3.052	51	59
	Cold storage at 7C° for 3 week	0.026	0.020	3.460	2.944	45	57
L. S. D at 5 %		2.60	2.85	1.09	1.19		

As for the interaction effect between planting date and cold storage on the yield of garlic, our results coincided with those of Quayouti and Kasvawi, (1995) who found significant interaction between planting date and cold storage temperature before planting.

Bulb quality: Data in Table (7) reveal that the diameter of bulb in the 1st season and bulb net weight (%) in the second season were higher with 1st Sept. planting date, whereas bulbing ratio in the 2nd season was higher with 15th Aug. planting date. Planting date had no significant effect on bulb dry matter (%) in both season, diameter of bulb in the 2nd season, bulbing ratio and bulb net weight (%) in the 1st season.

The favorable effect of 1st Sept. planting date on bulb diameter and dry matter percent in the bulb may be attributed to the effect of short day and low temperature at early stage of growth, followed by long photo period and high temperature during bulbing development, therefore, bulb diameter and dry weight of garlic bulb may increase (Ahmed, 2002). These results were coinciding with those reported by Shahien, (1987); El-Beheidi *et al.*, (1988); El-Shabasi, (1988); Park and Lee, (1990) and Gupta *et al.*, (2003) who concluded that Sept. planting date gave higher bulbing ratio, bulb diameter and average bulb weight (%).

It is also clear that the treatment of soaking only or soaking plus stratification for 24 hours were better than the other results in the first season. On the other hand, bulb net weight percentage and dry matter percentage showed high values from cold storage treatments for one or two weeks. Treatment of soaking or soaking and stratification indicated no clear trend among all these treatments in both seasons. These results of the interaction effect of planting date and soaking seed cloves in bulb diameter and bulbing ratio were in agreement with those of Abd El-Hameid, (1982).

Data in Table (8) illustrate the interaction effect between planting date and soaking seed cloves, soaking and stratification of cloves and cold storage of cloves before planting on bulb diameter and bulbing ratio, bulb net weight and dry matter (%) in bulb of garlic. Data declared that the interaction effect among treatments were significant and the highest values for the diameter of bulb were obtained with the soaking for 24 hours with the planting date of 15th Aug. followed by soaking for 24 hours also with the planting date of 1st Sept. in the second season. The lowest values of bulb diameters were obtained from the treatment of cold storage for three weeks at the planting date of 15th Aug. Regarding the interaction effect on bulbing ratio, data in the same Table show that the highest values were found at the planting date of 15th Aug. with soaking cloves for 24 hours in both seasons. The lowest values were noticed when the seed cloves were stored at 7C° for two or three weeks with 15th Aug. planting date in the two seasons of study.

Table (7): Effect of planting date and some pre-planting treatments of seed cloves on average diameter of bulb (cm), bulbing ratio, bulb net weight (%) and dry matter (%) of bulbs of garlic at harvesting date during winter seasons of 2006/2007 and 2007/2008.

Treatments	Average diameter of bulb(cm)		Bulbing ratio		Bulb net weight (%)		Dry matter of bulb (%)	
	1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Planting date								
15th August	4.15 b	4.18a	0.27 a	0.24 a	57.29 a	60.05b	24.93 a	24.03a
1st September	4.32 a	4.41 a	0.24 a	0.19 b	63.41a	66.03a	25.15 a	27.78 a
Some pre-planting treatments of seed cloves								
Soaking for 0 hr.	4.42ab	4.73 a	0.29ab	0.22bc	57.27d	59.51cd	25.06abc	25.63a
Soaking for 24 hr.	4.52 a	4.85 a	0.30 a	0.29 a	53.12e	60.44cd	23.89 c	25.47a
Soaking for 48 hr.	4.47 a	4.61ab	0.27 b	0.21bc	55.49de	62.71bcd	25.07abc	25.38 a
Soaking for 72 hr.	4.49 a	4.80 a	0.28 b	0.20bc	55.70de	63.69bc	26.06 a	25.69a
Soaking for 0 hr. + stratification for 0 hr.	4.53a	4.62ab	0.28ab	0.24ab	54.79de	58.86cd	24.55bc	25.28a
Soaking for 24 hr. + stratification for 24 hr.	4.46 a	4.56ab	0.28ab	0.23bc	56.28de	65.55bc	25.35ab	24.77a
Soaking for 48 hr. + stratification for 24hr.	4.40ab	4.50ab	0.28ab	0.22bc	55.38de	63.07bcd	24.93abc	25.27 a
Soaking for 72 hr. + stratification for 24 hr.	4.33ab	4.57ab	0.28ab	0.22bc	55.46de	61.85bcd	24.85bc	25.93 a
Cold storage at 7C° for 0 week	3.90 c	4.22 b	0.22 c	0.18bc	54.15de	55.37d	24.69bc	30.10a
Cold storage at 7C° for 1 week	4.19 b	4.68a	0.28ab	0.22bc	69.75 c	68.88ab	25.51ab	25.45a
Cold storage at 7C° for 2 week	3.80c	3.17 c	0.17d	0.17 c	76.46 b	74.81a	25.64ab	23.85a
Cold storage at 7C° for 3 week	3.36d	2.29d	0.17 d	0.18bc	80.39 a	61.73bcd	24.95abc	28.07a

Values having the same alphabetical letters did not significantly differ at 0.05 level of significance according to Duncan's multiple range test.

Table (8): Effect of interaction between planting date and some pre-planting treatments of seed cloves on average diameter of bulb (cm), bulbing ratio, bulb net weight (%) and dry matter (%) of bulbs of garlic at harvesting date during winter seasons of 2006/2007 and 2007/2008.

Treatments		Average diameter of bulb(cm)		Bulbing ratio		Bulb net weight (%)		Dry matter of bulb (%)	
		1st season	2nd season	1st season	2nd season	1st season	2nd season	1st season	2nd season
Planting date X Some pre-planting treatments of seed cloves									
15th August	Soaking for 0 hr.	4.50	4.81	0.29	0.24	54.52	54.69	24.52	24.24
	Soaking for 24 hr.	4.44	4.89	0.31	0.39	51.60	55.39	23.54	24.52
	Soaking for 48 hr.	4.46	4.63	0.28	0.22	52.08	58.15	25.02	23.93
	Soaking for 72 hr.	4.47	4.89	0.29	0.21	53.03	62.06	25.37	24.16
	Soaking for 0 hr. + stratification for 0 hr.	4.44	4.61	0.29	0.26	52.47	53.46	23.92	23.46
	Soaking for 24 hr. + stratification for 24 hr.	4.33	4.38	0.29	0.25	54.20	58.68	25.40	23.37
	Soaking for 48 hr. + stratification for 24hr.	4.40	4.43	0.29	0.22	54.74	59.50	24.66	24.30
	Soaking for 72 hr. + stratification for 24 hr.	4.22	4.53	0.29	0.24	53.41	53.87	24.80	24.39
	Cold storage at 7C° for 0 week	3.81	3.94	0.22	0.18	51.73	48.91	24.10	33.42
	Cold storage at 7C° for 1 week	4.13	4.66	0.30	0.24	63.45	66.57	26.67	24.05
	Cold storage at 7C° for 2 week	3.53	2.64	0.19	0.18	72.55	75.61	25.49	20.64
	Cold storage at 7C° for 3 week	3.06	1.79	0.19	0.20	73.69	73.68	25.72	17.85
1st September	Soaking for 0 hr.	4.34	4.64	0.28	0.20	60.01	64.32	25.59	27.01
	Soaking for 24 hr.	4.60	4.81	0.29	0.18	54.63	65.48	24.23	26.41
	Soaking for 48 hr.	4.47	4.59	0.25	0.19	58.89	67.27	25.12	26.83
	Soaking for 72 hr.	4.50	4.71	0.27	0.19	58.37	65.31	26.74	27.21
	Soaking for 0 hr. + stratification for 0 hr.	4.61	4.63	0.26	0.22	57.10	64.25	25.17	27.10
	Soaking for 24 hr. + stratification for 24 hr.	4.59	4.74	0.26	0.20	58.35	72.42	25.30	26.16
	Soaking for 48 hr. + stratification for 24hr.	4.40	4.57	0.27	0.22	56.02	66.63	25.19	26.23
	Soaking for 72 hr. + stratification for 24 hr.	4.43	4.60	0.27	0.20	57.50	69.83	24.90	27.46
	Cold storage at 7C° for 0 week	3.98	4.49	0.21	0.18	56.57	61.82	25.27	26.78
	Cold storage at 7C° for 1 week	4.24	4.70	0.25	0.20	76.04	71.18	24.34	26.84
	Cold storage at 7C° for 2 week	4.07	3.69	0.15	0.15	80.36	74.01	25.78	27.06
	Cold storage at 7C° for 3 week	3.65	2.78	0.15	0.16	87.09	49.78	24.17	38.28
L. S. D at 5 %		0.36	0.62	2.63	0.09	5.19	11.28	1.68	9.23

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تأثير معاملات ماقبل الزراعة لتقاوى الثوم على الوزن الجاف والمحصول وجودة الأبصال تحت مواعيد زراعة مختلفة

سمير كامل الصيفى ، محمود عبد المحسن حسن ، سوسن محمد حسن سرج و محمد احمد محمد على
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أجريت تجربتان حقليتان فى ارض رملية طميية بقرية الصوفية (مزرعة خاصة) ـــ أولاد صقر ـ محافظة الشرقية – مصر على محصول الثوم الصينى سلالة (سدس ـ ٤٠) اثناء موسمى الزراعة الشتوى (٢٠٠٦ / ٢٠٠٧ و ٢٠٠٧ / ٢٠٠٨) بهدف دراسة تاثير نقع فصوص الثوم فى الماء الجارى لمدة صفر ، ٢٤ ، ٤٨ ، ٧٢ ساعة ، النقع فى الماء الجارى لمدة صفر ، ٢٤ ، ٤٨ ، ٧٢ ساعة ثم كمر فصوص الثوم فى الجوت الرطب لمدة ٢٤ ساعة وتاثير التخزين البارد لفصوص الثوم عند ٧ درجة مئوية لمدة صفر، ١ ، ٢ ، ٣ أسابيع ، كل هذه العوامل قبل الزراعة بالإضافة الى تأثير ميعاد الزراعة (١٥ أغسطس ، ١ سبتمبر) . على الوزن الجاف والمحصول ومكوناته وجودة الأبصال. أوضحت النتائج المتحصل عليها ان الزراعة فى ١ سبتمبر ادت الى زيادة معنوية فى كل صفات الوزن الجاف والمحصول الكلى ومكوناته وجودة الأبصال . أدى نقع فصوص الثوم فى الماء الجارى لمدة ٢٤ ساعة قبل الزراعة لزيادة معنوية فى الوزن الجاف والمحصول الكلى ومكوناته كما أدت الى تحسين جودة الأبصال مقارنة مع معاملة الكنترول والمعاملات الأخرى. لوحظت التفاعلات الموجبة بين مواعيد الزراعة ومستويات كلا من النقع والنقع ثم الكمر والتخزين البارد لفصوص الزراعة قبل الزراعة فى حالات كثيرة.

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